An Iron Furnace at Work

The founder was boss, technician, raw material troubleshooter. He directed the ceaseless round of activity at Hopewell Furnaces. Rare materials—iron ore, limestone, and charcoal—were supplied by miners, woodcutters, and colliers and transported by teamsters. Fillers carted materials from the charcoal house area to the bridge house and dumped them at the tunnel head. Guttermen and moulders stood ready below to skim off the slag and cast the molten iron when it was tapped by the founder.

They tended the furnace, the glowing heart of their community; it yielded iron and a way of life.

Raw Materials of Iron Making

The basic ingredients of iron making—iron ore, limestone, and carbon fuel—are some of the most common materials on Earth, but are not found everywhere. Early furnaces were built where these materials were available. Iron is usually found in combination in form of hematite, the magnetite used at Hopewell, or other iron ores. Most iron ore was dug in small surface mines. Any substance that contained calcium, like sea shells, could be used as a flux, but for most furnaces limestone was cheap and abundant.

The Work Force

Historians have styled rural iron making operations like Hopewell’s, called “iron plantations,” as feudal. This was a self-sufficient community of craftsmen and laborers living directly or indirectly governed by the furnace. It could be a difficult taskmaster—dirty, noisy, dangerous at times, ever needing to be fed and tapped. But a demanding furnace also meant community prosperity. A silent furnace meant lean times.

A traditional hierarchy governed the furnaces’ operations. At the pinnacle was the ironmaster, director of the enterprise and often an owner. Good ironmasters had to be financier, technician, bill collector, market analyst, personnel director, purchasing agent, and host to prospective buyers. His was a volatile job; bad luck or poor judgment usually meant failure. Success often brought wealth. A clerk helped keep the books, ordered supplies, served as paymaster, and managed the office shop. The job well performed could be a stepping stone to ironmaster.

The quality of the iron was in the founder’s hands. His job was to keep the furnace blowing at peak efficiency. He supervised the other furnace workers: keepers helped him monitor the furnace and took the night shift; fillers charged the furnace with raw materials; and guttermen directed molten iron as it flowed from the furnace.

The Founder’s Art

In the “flask casting” method of casting, both sides of a stove plate were molten. This let the moulders produce a relatively light, curved plate. The flask was two wooden frames. The moulder laid the bottom half, the “drag,” on a piece of paper called the “follow board,” placing the wooden pattern inside. He then sifted fine sand over the pattern and packed the rest of the drag with coarse, damp sand. After scrapping away excess sand with the “spike” 2, he placed another follow board on top and turned over the drag.

He then removed the first follow board, blew away loose sand from the edges of the pattern with a bellows 3, and dressed the edge with a moulder’s thumb. He attached the “cops,” the flask’s top half, to the drag and again added fine and coarse sands. Before packing the sand he inserted a wooden wedge to form a “gate” 4, allowing the molten iron to enter. Next he removed the wedge, separated drag and cope, and carefully removed the pattern with a pair of tongs 5. He next secured the halves of the flask with iron clamps.

The final step was to pour the molten iron 6 through the gate. After the iron had cooled, he separated the halves of the flask and removed the gate from the plate. Other workers brushed off sand and fined rough edges, readying the plate for market.

The Moulder’s Art

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To make the most money from molten iron you would cast finished products at the furnace. Moulders cast several items—plooshers, pots, sash and scale weights, cannon, and shot. But in these times more common in fields was Hopewell built its operation on stove plates.

Cast products made profits, but the age also demanded exquisite work. The founder’s brittle high-carbon iron was not suitable for the tough, malleable wrought iron needed for pole masts, nails, and horseshoes. Any product not in place at Hopewell. The molten iron was cast in pig iron bars shipped elsewhere for refining.

At a foundry forge, the iron was remelted and much of its carbon was oxidized, raising the melting point. The iron partially solidified in a party lump. The lump was then beaten to drive out the slag and align the fibers, producing wrought iron. More processing of this iron into the bars and rods used by blacksmiths. A lengthier process was used to convert iron to steel. Hopewell’s owners often held interests in local forges and mills.